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The American FERTILIZER

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The American FERTILIZER

Vol. 106 APIRL 5, 1947 No. 7

The Phosphate Industry: A National Asset

Some Highlights in the Development of the Phosphate Industry—with Special Reference to the United States

By VINCENT SAUCHELLI
Director, Agricultural Research, The Davison Chemical Corporation

THE phosphate industry started in 1840 with the publication of Justus von Liebig's great book, *Organic Chemistry in Its Applications to Agriculture and Physiology.* In that pioneer book Liebig discussed the inter-relations of soil minerals, animal manures, light, air, and moisture and the use of ground bones in supplying phosphates and lime to the growing plant. He knew that grinding bones to a fine mesh caused them to decompose more quickly in the soil. To this same purpose he recommended for the first time (pp. 188–185) the practice of adding sulphuric acid to bones to render the phosphate they contain more quickly available to plant life. He also predicted the rise of a great chemical fertilizer industry (pp. 187-188): "A time will come," he wrote, "when fields will be manured with a solution of glass (silicate of potash) with ashes of straw and the salts of phosphoric acid, prepared in chemical factories."

Within a generation from the time he published his book, the fertilizer industry was in fact well established. The subsequent rapid development was due primarily to the vision and work of Sir John Bennett Lawes, an Englishman, who was the first to produce a commercial water-soluble phosphate by treating a raw phosphate carrier with sulphuric acid. Lawes took out a patent in May, 1842 in which he claimed to make superphosphate, "by decomposing bones, bone ash, bone dust, apatite, phosphorite, and other substances containing phosphoric acid, mixing a quantity of sulphuric acid just sufficient to set free such phosphoric acid as will hold in solution the undecomposed phosphate of lime."

By 1862 plants in the United Kingdom were producing over 150,000 tons of superphosphate. As a result of its effective properties to furnish essential phosphorus to plant life, superphosphate continued to be popular so that by 1940, a century later, the world production of ordinary superphosphate amounted close to about 16 million metric tons of 17 per cent average P_2O_5 content. The United States accounted for about 25 per cent or nearly 4 million tons and Great Britain about 560,000 tons.

Rock Phosphate Deposits

The United States has been blessed by Nature with generous deposits of rock phosphate. Blessings of this kind seem to be more appreciated in periods of extreme emergency such as that experienced during the recent Global War. German scientists have strongly lamented the lack of phosphate sources within the Reich. For it cannot be denied that agriculture is the solid strength of any nation. As Liebig pointed out in his remarkable book, referring to agriculture: "there is no profes-

sion which can be compared in importance with that of agriculture, for to it belongs the production of food for man and animals; on it depends the welfare and the riches of states, and all commerce. There is no other profession in which the application of correct principles is productive of more beneficial effects, or is of greater and more decided influence." (Page 138.)

The Key to a Permanent Agriculture Is Phosphorous

Phosphorus is essential to all life—plant, animal and human. Its only source is in natural deposits; it has no substitute; it can not be synthesized. Without it in adequate, available quantities, plants cannot grow nor utilize calcium. Animals grazing on phosphorus-deficient herbage become susceptible to diseases, bone disorders, and nutritional anemia. Health for humans and animals is linked directly to fertile soils.

Phosphorus is the most widely distributed mineral in the human body, being found in every cell and performing vital functions. Only calcium is present in larger quantities. It is found in relatively large amounts in the seeds of all plants and in the chromosomes of all plants and animals.

Although phosphorus is only one of the essential nutrients, its essentiality is emphasized by the fact that it is present in thesoil in limited quantities only, and cannot, like nitrogen, be synthesized by man. When it is deficient in cropland, it can only be replaced by applications of phosphatic fertilizers or animal manures and plant residues.

These considerations impel every civilized country to secure its supplies of phosphorus by all means. Processing raw rock phosphate is one of the most important means of obtaining phosphorus plant food. A country which has rock phosphate deposits within its borders is, therefore, in a stronger, economic position than less fortunate countries. In this respect the United States, as previously mentioned, is enviably strong. Within its borders ir has about 51.5 per cent of the world's known deposits or about 14.8 billion tons.[1] Despite this huge natural resource, a great deal of concern has been expressed by agricultural leaders regarding the enormous net annual losses of phosphorus from our soils caused by agricultural production and soil erosion. According to a study made by the National Resources Board reported to the Congress in 1939, the net annual loss of phosphorus in the United States is about 3.2 million tons of P_2O_5, equivalent to that contained in 16 million tons of 20 per cent superphosphate.

It was estimated by the Joint Congressional Committee that "this rate of loss, if continued, would exhaust the phosphoric content of the soil of the United States in 240 years, but long before that time conditions would have become intolerable. Exhaustion to the point where the land cannot be farmed has already occurred on millions of acres."

Table I prepared by Dr. G. D. Scarseth[2] is a more detailed outline of annual losses and replenishments of phosphate in this country.

TABLE I

PHOSPHATE ANNUALLY LOST FROM THE SOILS OF THE UNITED STATES, ITS VALUE AND AMOUNTS RETURNED IN FERTILIZER

Items	Phosphate (P_2O_5) Tons 1,000	Dollars
Crops (harvested areas)*	1,600	$160,000,000
Grazing (pastures)	1,145	114,000,000
Total lost by crops and grazing	2,745	274,000,000
Lost by erosion and leveling of harvested acres only	2,061	206,000,000
Estimated grand total lost in nation by crops, grazing, erosion and leaching of cropped acres	4,806	480,000,000
Applied as fertilizer 1944	1,305	130,000,000
Same in per cent	27%	.....
Applied as fertilizers, annually 1935–1939	719	72,000,000
Same in per cent	15%	.....
Recommended as desirable	2,700	270,000,000
Same in per cent of grand total lost	58%	.....

*Values taken at approximately retail market prices of 5 cents per pound P_2O_5 or K_2O. These values are hardly realistic when applied to nutrients to replace losses and to build soil fertility.

Area considered: Harvested crops, 365 million acres; grazing, 1,000 million acres. Total area of U. S.A., 1,900 million acres.

(Compiled from *Soils and Men*, page 99, 1938, and other U. S. D. A. releases by G. D. Scarseth.)

Phosphate Rock Consumption

The consumption of phosphate rock in the United States has steadily grown since 1868, the date of the discovery of rock in South Carolina. The National Fertilizer Association (NFA) has estimated that the long-time growth trend indicates a consumption of about 6½ million tons within the next 25 years if all factors continue favorably. You see the rate of rock consumption and superphate production in the United States in Table II based on NFA and U. S. D. A. statistics.

[1] U. S. D. A. Miscel. Publ. No. 586.
[2] Director, American Farm Research Association.

Exports of Rock

Our foreign trade in phosphate rock before the war was large, amounting in the 1935–1939 period to an average of 1,220,000 long tons per year. It is expected that the export trade will, in due time, be resumed since the shortage of phosphate deposits in the large consuming markets of Europe, Asia and South America makes it necessary for. them to import this essential commodity.

TABLE II

ROCK CONSUMPTION AND SUPERPHOSPHATE PRODUCTION IN THE U. S.

Year	Rock Production*	Rock Consumption*	Superphosphate Production (Basis 18% grade)
	1,000 long tons	1,000 long tons	1,000 net tons
1910	.....	.....	2,595
1920	4,596.4	3,398.6	5,130
1930	4,397.6	3,061.3	4,415
1940	4,483.0	3,644.7	4,865
1944	5,200†	5,377†	7,395
1945	5,400†	5,807†	8,039

* U. S. D. A. Miscel. Publ. No. 586.
† U. S. D. I. Bu. Mines Report MMS. No. 1412.

TABLE III

PHOSPHATE RESOURCES OF THE WORLD*

Region	1,000 tons	
United States		14,885,763
Florida	5,691,660	
Tennessee	217,804	
Idaho, Montana, Utah, Wyoming	8,943,079	
Arkansas, Kentucky, South Carolina	32,220	
Russia		8,342,291
North Africa (Algeria, Morocco, Tunesia)		3,876,277
Egypt		197,314
Nauru and Ocean Islands		154,324
Other countries		1,414,287
		28,870,256

*U. S. D. A. Miscel. Publ. 586.

World Deposits of Rock Phosphate

Russia has large deposits of phosphate rock estimated at nearly 8 billion tons, with about one billion tons near the Kars-Tau Mountains in central Asia.

The other large deposits of the world are located in North Africa and in some of the islands of the South Pacific. Germany's keen interest during the recent war in seizing North Africa and Japan's early seizure of Ocean and Nauru Islands no doubt were prompted by their hunger for much needed phosphorus—a resource these two aggressive nations do not have within the borders of their homeland.

Phosphate Processed Materials

As previously pointed out, most of the mineral phosphate returned to agricultural soils is in the form of superphosphate. From the early days of Sir John B. Lawes available phosphates have been made by low-cost methods involving essentially the action of sulphuric acid on the raw rock—the so-called "wet method." Even today in the United States, more than 85 per cent of the phosphate materials used in fertilizing the soil comprise superphosphates derived by this method. Some improvements have been made, especially in the equipment. The granulation process recognized as an outstanding improvement in superphosphate technology was introduced by the Davison Chemical Company in the early 1930's.

One of the chief arguments against ordinary superphosphate is that it carries a relatively low percentage of plant food, namely from 16 to 20 per cent P_2O_5 equivalent. Otherwise it is an excellent fertilizer, simple and easy to make and fairly economical when used close to producing points. That, of course, is the important reason why its top place among the fertilizer phosphatic carriers has been unchallenged for over a century.

The fertilizer industry has not, until recently, been able to get farmers to accept concentrated superphosphate, despite many sales campaigns. Farmers are inclined to buy fertilizer on the cost-per-ton or per-bag basis and not on the cost-per-unit of plant food. This farmer attitude undoubtedly has been the cause for the relatively small success in marketing the concentrated superphosphates.

Concentrated superphosphate is produced by treating raw rock phosphate with phosphoric acid in place of sulphuric acid. The concentrated material averages about 45 per cent P_2O_5 and does not have the gypsum content of the normal 18 to 20 per cent material. The cost per pound of phosphorus in the concentrated superphosphate at the works is higher than the corresponding cost of a pound of phosphorus in the normal grade. However, the cost delivered to the farm may be lower, owing to savings in the cost of bags, handling charges, freight and other economies, depending upon distance from point of production to the farm.

Because of the potential economies in the more concentrated grade, a strong effort has been made in recent years to get farmer acceptance. Beginning in 1935, the Tennessee Valley Authority undertook an intensive campaign of education and farm demonstration to induce the farmer to buy phosphate on the basis of plant nutrients and to train him in the economic use of phosphate in an adjusted farm program. Later with the help of the Agricultural Adjustment Administration, the TVA distributed concentrated superphosphate to farmers in the Tennessee Valley Authority and even beyond in lieu of cash grants-in-aid. The net result has been a considerable increase in demand, especially in the Midwest, for concentrated superphosphate for direct application and for mixed fertilizers of higher plant food content, in which it is necessary to use the concentrated superphosphate. The fertilizer industry could not have undertaken such a comprehensive and intensive educational program owing to the costs.

As a part of its comprehensive research program, the TVA has developed several processes for the production of new, concentrated phosphorus carriers which have not as yet reached commercial status. These are calcium metaphosphate (65 per cent P_2O_5), potassium metaphosphate (55 per cent P_2O_5, 35 per cent K_2O) and calcined phosphate (up to 30 per cent P_2O_5). Several commercial installations are now producing the calcined phosphate which finds its way primarily to the livestock feed trade.

Advances in phosphate technology have been made in the large-scale commercial development of the electric-furnace process for producing elemental phosphorus and concentrated phosphoric acid of high quality. Commercial manufacture of phosphoric acid by the blast furnace method is another achievement.

Industrial developments in the mining of rock have also been made which result in the more efficient utilization of low grade ores. These have the effect of increasing the Nation's reserves of phosphate rock. First among these advances is the application of flotation principles in the recovery of raw phosphate.

The fertilizer industry is concentrated in regions where fertilizer consumption is largest. The location of superphosphate plants is

(Continued on page 30)

Courtesy—The Davidson Chemical Corporation, Barlow, Fla.

PIT OPERATION OF A FLORIDA LAND-PEBBLE MINE
Note dragline excavator removing over-burden

Nitrogen Facilities Increasing

Convincing evidence is now at hand to show that the fertilizer industry is taking long strides toward providing American farmers with increased supplies of fertilizer nitrogen, Maurice H. Lockwood, President of the National Fertilizer Association, said recently.

"It should be made clear, however," said Lockwood, "that the necessity of correlating and in some cases constructing and equipping nitric acid and graining units with wartime fixation plants is a big job and may require eight to twelve months' time. Industry is proceeding as rapidly as possible with the job and besides already taking over five Government plants, has indicated its readiness to adapt for practical commercial production other Government plants currently operated for the Army ordnance program."

The current issue of the *Fertilizer Review*, published by the Association, presents a study of the progress being made, including industry's conversion of the five Government nitrogen fixation and conversion plants to peacetime use. "The capacity of these five plants to produce nitrogen for agricultural use amounts to 475,000 tons annually," states the *Review*.

This capacity amounts to about 28 per cent more nitrogen than was used for agriculture in the entire United States and its possessions during the average of the five years before the war, 1935–1939, and to two-thirds as much nitrogen as will be available to United States agriculture for the 1946–1947 fertilizer year. In addition, there is a production capacity in privately owned synthetic plants constructed before the war of an estimated 431,000 tons of nitrogen, a production capacity of approximately 143,500 of by-product nitrogen from coke ovens and indicated imports of some 200,000 tons of nitrogen in various forms. The *Review* further points out that all three of the Canadian nitrogen fixation plants now taken over by industry will provide a substantial proportion of their fertilizer nitrogen output to the United States for agricultural use.

In his statement, Lockwood expressed his conviction that current developments clearly indicate industry's readiness to convert war-built facilities to effective peacetime use, and to place such plants on a competitive basis, stepping up the efficiency of their operation over their wartime pace, and removing from the taxpayers of the nation the burden of Government operation. He expressed confidence that the industry would make substantial headway toward meeting the 1947–1948 agricultural nitrogen requirements of the United States and its possessions, estimated by the U. S. Department of Agriculture Fertilizer Industry Advisory Committee on March 13th at 800,000 to 850,000 tons, compared to an apparent supply this year of 693,000 to 723,000 tons.

New Jersey Tonnage, 1946

Sales of 259,799 tons of fertilizers during 1946 in New Jersey were reported by Stacy B. Randle, state chemist, as compared with 245,173 tons in 1945. Mixed fertilizers comprised almost 90 per cent of the tonnage, totaling 234,812 tons.

The leading grades were 5–10–10, 77,768 tons; 4–12–8, 55,946 tons; 5–10–5, 38,632 tons; 3–12–6, 24,208 tons; 3–9–12, 11,281 tons. Of the individual materials applied, superphosphate with 12,138 tons and nitrate of soda with 4,578 tons were the leaders.

In addition to the above fertilizers, 196,088 tons of agricultural lime in various forms were used by the New Jersey farmers.

Maryland Fertilizer Tonnage, 1946

Figures compiled by L. E. Bopst, state chemist, show that 244,743 tons of fertilizer were used in Maryland during 1946, exceeding the previous record year of 1945 by 26,000 tons. Sales of complete fertilizers totaled 207,936 tons, with superphosphate-potash mixtures amounting to 12,244 tons. Forty complete fertilizer analyses were registered, compared with over one hundred in the pre-war years. The average analysis of mixed fertilizers sold was 3.6 per cent N, 11.6 per cent P_2O_5, 7.5 per cent K_2O; a total of 22.7 units of plant food per tons.

The 3–12–6 grade accounted for 110,906 tons, almost half of the mixed fertilizers. Other popular mixtures were 4–8–12 with 21,602 tons; 5–10–5 with 16,774 tons; 6–8–6 with 13,570 tons, 4–12–8 with 13,069 tons.

The sales of grades recommended by the State agronomists amounted to 210,442 tons. No sales were made of the 10–0–10, 4–12–12 or 0–10–20 recommended grades.

It is interesting to note that the figures for 1913 show sales of 178,000 tons, the best seller being the 1–8–1 grade. Maryland farmers are now buying more than twice the quantity of plant food, although the actual tonnage has increased only about one-third.

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Vol. 105 APRIL 5, 1947 No. 7

Principal Articles in This Issue

Fertilizer Conditioning

By John N. Everson, Assistant Professor of Agronomy, Massachusetts State College, Amherst, Mass.

When the old-time fertilizer manufacturer first used organic by-products as sources of mitrogen, he had to improve the drillability of his product. The fertilizer was too fluffy. He added sand to his mixture to make it feed in the distributing equipment.

Thirty years later the same fertilizer manufacturer is faced with new problems: (1) the cost of seed meals and other organic conditioners had gone up; and (2) the use of double-strength formulas makes the manufacture of a drillable product more difficult.

The writer is familiar with these problems because of his former association with the fertilizer industry. He, therefore, welcomed the opportunity to cooperate with Godfrey L. Cabot, Inc., in a study of the use of carbon black as a soil conditioner.

Some of the results of this work may now be reported. Commercial mixtures of 5–8–7 fertilizer were made by a fertilizer company. Carbon black was added to one-half of each sample. It was found that the use of as little as fifty pounds of carbon black per ton resulted in a product which was more drillable in rainy weather than the untreated samples. The samples were made in May. In August the carbon-treated sample was still drillable although it had been kept in an open shed. After eight months, it was more friable than the untreated sample of fertilizer.

In another phase of this project, detailed studies were made of the effect of carbon black on soil temperature, moisture, aggregation, and pest control. Studies were made from 1944 to the present time. At no time was any toxic effect observed, although as much as 4,000 pounds of carbon black per acre were used. Indeed, shallow rooted crops seem to have benefited by the addition of carbon black. It was also observed that the temperature of the soil was somewhat increased. In the case of direct application of carbon to the soil, the clay fraction showed aggregation. There were indications that millipede infestation had decreased. In the zone of fertilizer application, there was evidence of control of potato scab.

Another phase of this investigation is the study of the effect of carbon black upon reversion of phosphoric acid when ammonia liquor is used. It is well known that production

costs would be lowered if reversion could be prevented. Reports on this and other phases of the study will be published in the near future.

The writer is interested in cooperating with manufacturers on this work. Letters may be addressed to Professor John N. Everson, Amherst, Mass.

British Fertilizer Men on American Tour

An official goodwill visit by British fertilizer manufacturing leaders is now being made to American fertilizer manufacturers, according to Maurice H. Lockwood, president, The National Fertilizer Association. The members of the party arrived in New York by plane on March 29th and are now in Washington where they will stay until April 5th consulting with governmental and private industry leaders and inspecting agricultural and manufacturing institutions in the area, including Baltimore. A luncheon in honor of the British group was given in New York and another in Washington.

The remainder of the itinerary will include visits to fertilizer plants in Richmond, Va., April 6–7; Tampa, Fla., April 8–10; Atlanta, Ga., April 11–13; Muscle Shoals, Ala., April 14–15; and Chicago, Ill., April 16–19; with a concluding journey to Canada. The party will return to England via New York, leaving April 24th.

The group is headed by D. J. Bird, president of the Fertilizer Manufacturers' Association, Ltd., and includes A. T. Vernon, vice-president, E. P. Hudson, and A. E. Sell.

Easley Appointed American Cyanamid Agriculturist

Frank S. Washburn, director of fertilizer sales for the American Cyanamid Company, announces that Tildon Easley, formerly of the University of Arkansas and Texas A. &. M. College, has accepted the position of Agriculturist for the southwestern states. He assumed his new duties on March 17th and makes his headquarters at Little Rock, Ark.

Mr. Easley is a native of Mississippi. He attended Mississippi State College where he received his degree of Bachelor of Science in general agriculture and his Master of Science degree in botany and agronomy. He took further work in plant physiology and plant genetics at the University of Wisconsin.

While at Texas A. & M. College, Mr. Easley was on full-time teaching in cotton and general crop production in both the undergraduate and graduate schools. He also assisted in supervising field plot demonstrations for use in teaching.

At the University of Arkansas, Mr. Easley originally taught and did research in the Department of Agronomy and later became Agronomist with the Agricultural Extension Service. In research, he handled work with small grains and sorghums and conducted nutrition studies on cotton. As an extension agent, he kept all county agents informed of the Experiment Station results, made recommendations on crop production and pasture improvements, suggested and set up demonstrations and serves as Secretary-Treasurer of the Arkansas Seed Growers Association.

Mr. Easley's wide experience in the agronomic field of the South places him in a good position to work with his many friends on projects of mutual interest.

Potash Deliveries Break Records in 1946

The five leading American potash producers made a new high record when they delivered 923,127 tons K_2O in 1946. This 54,941 tons or 6.3% more than in 1945 and continued for the twelfth year the unbroken record of increased deliveries over the preceding year, according to the American Potash Institute. This total was in the form of 1,657,603 tons of potash salts.

Deliveries for agricultural purposes in the continental United States for 1946 were 763,590 tons K_2O, an increase of 68,514 tons over 1945. Canada received 42,772 tons K_2O, Cuba 2,327 tons, Puerto Rico 18,958 tons, and Hawaii 8,380 tons, in each case a little less than in the preceding year. Exports to other countries amounted to 10,963 tons.

In this country the potash was delivered in 45 states and the District of Columbia, three more states than in 1945. Georgia retained its leading position for deliveries of agricultural potash with 70,709 tons K_2O, but Illinois moved from fifth place in 1945 to second in 1946, followed in order by Ohio, Florida, Virginia, and North Carolina, each taking more than 55,000 tons K_2O during the year. Consumption by farms does not correspond to deliveries within a state.

The 60% muriate of potash grade continued to be by far the most popular material, comprising 81% of the total K_2O delivered

for agricultural purposes. The 50% muriate of potash grade made up 7% of the total, manure salts 3%, and sulphate of potash and sulphate of potash magnesia 9%. In actual tonnage, the 60% muriate increased by 69,669 tons over 1946, the 50% muriate was about the same, manure slats decreased, and both sulphate forms increased.

POTASH DELIVERIES—AMERICAN ORIGIN
CALENDER YEARS, 1945 AND 1946
Short Tons K_2O

	Calendar Year 1946	Calendar Year 1945
Agricultural		
United States		
Muriate 60%	615,098	545,429
Muriate 50%	61,585	61,352
Manure Salts	21,453	34,464
Sulphate and Sulphate Potash Magnesia	65,454	53,831
Total	763,590	695,076
Canada	42,772	44,454
Cuba	2,327	4,077
Puerto Rico	18,958	19,048
Hawaii	8,380	10,776
Total Institute Territories	836,027	773,431
Other Exports	10,963	8,897
Total Agricultural	846,990	782,328
Chemical		
United States		
Muriate 60%	72,573	82,156
Sulphate of potash	2,224	2,713
Total	75,797	85,169
Canada		
Muriate 60%	340	689
Total chemical	76,137	85,858
Grand total	923,127	868,186

Deliveries for chemical purposes in 1946 were 117,752 tons of muriate of potash containing an equivalent of 72,913 tons K_2O and 4,356 tons of sulphate of potash containing 2,224 tons K_2O. The total chemical deliveries of 76,137 tons K_2O were 9,721 tons or 11% less than in 1945.

In the fourth quarter of 1946 deliveries totalled 408,330 tons of salts containing an equivalent of 228,250 tons K_2O, an increase of 3% compared to K_2O deliveries in the same 1945 period. The continental United States received for agricultural purposes 185,159 tons K_2O, Canada 10,961 tons, Cuba 733 tons, Puerto Rico 4,765 tons, and Hawaii 1,323 tons. Exports to other countries were 4,173 tons K_2O.

Kentucky Station Recommends Cyanamid Fertilizer

Calcium cyanamide (cyanamid) is a satisfactory nitrogen fertilizer, says the Kentucky Experiment Station, in reply to inquiries. For row crops it is recommended that it be applied broadcast and disked in about two weeks ahead of setting or planting. It also can be broadcast before plowing and turned under.

At the Experiment Station farm at Lexington cyanamid has been applied without injury to burley tobacco plants at the rate of about 250 pounds to the acre. Application was made in bands on each side of the row at the time the plants were set, most of the fertilizer being placed about 3 inches deep and 5 inches from the plants. It probably should not be placed closer than 12 inches to the plants.

Cyanimid is considered good top-dressing for pastures and small grains at a rate of 200 to 300 pounds or less an acre. There is less danger of injury from the granulated form.

FERTILIZER MATERIALS MARKET

NEW YORK

Abnormal Demand and Limited Supply for All Fertilizer Materials. Demand for Spot Potash Strongest and Far above Anticipated Production. Transportation Shortage Hampers Superphosphate Production. More Potash Land To Be Opened for Prospecting.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, March 31, 1947.

It can only be reported that the conditions of abnormal demand and limited supply continue to prevail in all fertilizer materials markets. Interest is active for every basic fertilizer ingredient from both foreign and domestic buyers. Potash seems to have replaced sulphate of ammonia as the most sought-after item at this particular time, and demand for muriate during the spot period far exceeds anticipated production.

Organic materials are quiet with few offerings in the market, and those prevailing are holding at previously established levels. Trading by feeders has been kept to a short-term basis in anticipation of possible lower markets in the near future.

Sulphate of Ammonia

Interest in this area has slackened off somewhat, but demand still exceeds available supplies. Production at the coke ovens is at high levels, but difficulty in obtaining boxcars has kept deliveries behind schedule in many cases. The possibility of further price increases has been rumored, but no announcements from any producers at this writing.

Nitrate of Soda

Demand has become increasingly active with practically no stocks to draw on. Imported material is expected to be in better supply later and domestic production remains short, due to scarcity of raw materials required.

Organic Materials

These markets continue quiet. Last sales of dried blood were reported to have been at $9.25 ($11.24 per unit N) f.o.b., with sellers holding firm at this level. Tankage sold in this market at $8.50 ($10.33 per unit N), with the tendency definitely upward. Soybean meal for immediate shipment is quoted at $77 per ton in bulk, basis Decatur.

Superphosphate

Delay in shipments of phosphate rock has retarded ability of superphosphate producers to anywhere near satisfy present demand. This market is extremely tight and no easing of the situation can be expected before the next fertilizer season.

Potash

Main interest in this market, aside from buying for the spot period, is speculation as to price basis for the new fertilizer year. Changes in schedules have been announced by several of the major producers, but application is only for the April–May period. It has just been announced by the Department of the Interior that additional permits will be issued for prospecting new potash bearing lands. The action was taken on the recommendation of fertilizer industry officials and will increase the total land which may be held for this purpose to 40,960 acres.

PHILADELPHIA

Some Improvement in Chemical Nitrogen Production but Supplies Still Short of Demand. Prices Up on Spot Materials.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, March 31, 1947.

While there has been improvement in the production of ammonium nitrate and of sulphate of ammonia, other fertilizer chemicals are still exceedingly scarce, and the demand for conplete fertilizers is far in excess of the present visible ability to supply.

Sulphate of Ammonia.—While the production is improved, the demand still continues greatly in excess of the capacity to supply.

Nitrate of Soda.—The demand is very active in all sections of the country and the supply exceedingly short. In some sections the situation is critical, due to the unsatisfied demand for top dressing.

Blood, Bone, Tankage.—During the past few days the demand for these organics has been exceedingly brisk and prices have advanced materially. Most of the inquiry was from the feeding trade, with blood sales as high as $10.00 per unit of ammonia ($12.16 per unit N) and tankage at $9.00 ($10.94 per unit N). The demand for bone meal was very strong with no reduction in price.

Fish Scrap.—There was some demand for fish meal during the past few days with quotations ranging from $150 to $160 per ton, and ready buyers at $140 per ton.

Phosphate Rock.—Producers are still unable to cope with the demand and there is talk of price advance in some directions.

Superphosphate.—Sales are reported at 76 cents per unit, but the article is exceedingly scarce and it is doubted that additional lots could now be had at any price.

Potash.—There seens to be no improvement in the supply situation and the demand continues to be in excess of the capacity to produce. Odd lots of nitrate of potash and carbonate of potash are finding a fairly ready market with fertilizer mixers.

CHARLESTON

Record Tonnage Being Moved in Spite of Material Shortage. No Improvement in Material Supply for This Season Expected.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, April 1, 1947.

The "big three" in materials still remain tight in supply and insufficient to meet the call. These are mineral nitrogen, superphosphate and potash. In spite of the shortages, farmers will have received more fertilizer this season than ever before and at prices that have shown less increase by far than the cost of almost any other commodity on the market.

Organics.—Interest in organics for fertilizer use is slack at present as the fertilizer manufacturers near the end of their season. Cottonseed meal is quoted around $70.00 for 7% ammonia material in bags, f.o.b. Southeastern producing points. South American organic materials remain high for fertilizer use and market is quiet. Little, if any, European fertilizer organics are reaching the U. S.

Castor pomace.—Practically no offerings of castor pomace, which indicates whatever is moving is against existing contracts.

Hoof meal.—Market is quiet but prices firm.

Blood.—Dried ground blood is firm, with sales confined mainly to the feed trade. Price is around $9.00 ($10.94 per unit N), Chicago. Some has been offered prompt from Pennsylvania at around $9.30 ($11.30 per unit N), with bags extra.

Tankage.—Price has advanced about 50 cents per unit ammonia and quotations are around $9.00 per unit ammonia ($10.94 per unit N) at Chicago.

Nitrate of Soda.—Stocks exceedingly short, and demand active. Arrivals from Chile move immediately from dock to the country. Price remains same. Domestic production remains far behind demand.

Sulphate of Ammonia.—Supply is short of demand. Price remains firm with some re-sale material being sold at prices far above producers' charge.

Ammonium Nitrate.—January output reached a new high but supply is still insufficient to meet the demand. Price remains firm at the levels prevailing during past several months.

Potash.—No bettering of the short supply situation has been reported and demand outstrips supply. It is reported that all the French potash that was offered recently has been taken up by U. S. buyers. There is a rumor that Russian potash will be coming in later in 1947 but price asked so far is above buyers' ideas.

Superphosphate.—Market remains exceedingly tight and practically no stocks are on hand. Demand is strong and prices firm.

Phosphate Rock.—Domestic and export demand is short but deliveries to U. S. acidulators are behind schedule due to car shortages. Prices are firm and change upward as the price of fuel oil increases. Fuel oil increased in price 20 cents per barrel recently, causing an increase of 10 cents per ton in rock from one producer.

CHICAGO

Less Inquiry for Organic Ammonates. Feed Material Prices Advance.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, March 29, 1947.

The active inquiry for organics has noticeably diminished recently, which could indicate buyers realize the scarcity, or they have sufficient ammoniates for this season. So far, no appreciable interest has been shown for futures. It seems probable that market values for next season's business are too uncertain at this time.

Strong demand for feeds has been and still is greater than the supply. Prices have been advanced by most producers. Last sales of unground wet rendered tankage and of unground blood were at $9.00 per unit ammonia ($10.94 per unit N) f.o.b., shipping points.

Sulphate of Ammonia, January-February

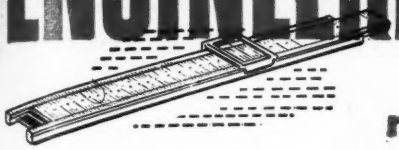
Production of by-product sulphate of ammonia during January and February increased from the previous months, the daily output being around 2,200 tons, according to the figures of the U. S. Bureau of Mines. Shipments during these two months were about 7,000 tons less than production, due principally to the shortage of box cars which has been hampering all departments of the fertilizer industry. As a consequence, stock on hand at producers' plants increased from 33,000 tons on December 31, 1946 to 40,000 tons on February 28, 1947.

	Sulphate of Ammonia Tons	Ammonia Liquor Tons NH_3
Production		
January, 1947	68,045	2,165
February, 1947	61,298	2,282
January, 1946	43,523	1,640
February, 1946	28,576	2,074
Shipments		
January, 1947	65,726	2,143
February, 1947	56,401	1,919
January, 1946	51,419	2,039
February, 1946	29,094	1,594
Stocks on Hand		
February 28, 1947	40,080	817
February 28, 1946	23,651	727

Borax Tobacco Experiments

The use of 2½ pounds of borax resulted in an average increase of $27.00 per acre in the value of tobacco produced in experiments conducted by E. M. Matthews and M. H. McVickar of the Virginia Agricultural Experiment Station. Borax-treated plots gave an average yield of 1,247 pounds of tobacco per acre while untreated plots gave an average yiled of 1,186 pounds per acre. Throughout the five-year period in which the experiments were conducted, small amounts of borax gave consistent increases in yields, with 2½ pounds per acre appearing to be the optimum application for maximum production of high quality tobacco. The same results were obtained from mixing with the planting mixture or with the regular side-dressing fertilizer.

ENGINEERED PACKAGING



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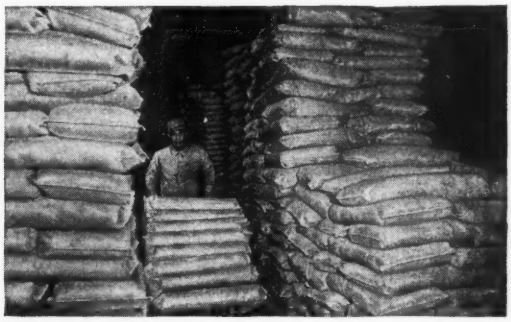

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Prospective Plantings for 1947

Optimistic about the season's prospects in most areas, farmers intend (as of March 1) to plant a slightly larger total acreage of principle crops than those of the past 2 years. Shifts between crops are also significant. Much of the shifting is due to the near-record acreage wheat sown last fall which is still doing well, and to the demand for oil crops—flaxseed and soybeans. These tend to limit the acreage available for sorghums, corn, oats and some others. Barley and durum wheat appears to be gaining favor at the expense of other spring wheat, while sugar beets, beans and peas are replacing potatoes in many competing areas. Part of the producers' optimism is due to improvement in farm labor and machinery supplies. Furthermore, they were able to get much work done last fall so that they are in a strategic position to start spring work as the season develops. Spring is progressing about normally. Soil moisture is mostly satisfactory, except in the extreme Southwest. A relatively severe winter in the South has prevented premature fruit budding and tending to reduce the insect hazard to crops. Farmers are preparing to take advantage of what they regard as favorable price prospects for another year.

The aggregate acreage of crops now planned would exceed that finally planted last year by about 2.3 million acres and that of 1945 by nearly a million acres. It would be 7.4 million acres below the wartime peak of 1944, however, so that under present favoring conditions it appears quite possible that intentions can be realized. Allowing for duplications and for certain crops not yet surveyed, the total of principal crops planted or grown in 1947 may approach 358 million acres, compared with 355½ million last year, an average of 355 million in the ten years 1936–1945 and the high mark of 375½ million acres in 1932.

Comparing the intended acreages for 16 major crops with 1947 goals for the same crops, the prospective aggregate is about 1 per cent below the goals. Exceeding goal acreages are: wheat, oats, rice, tobacco, dry peas and peanuts. But corn, barley, flaxseed, sorghums, potatoes, sweet potatoes, dry beans, soybeans for beans, sugar beets and hay fall below. Relatively small acreages of some of these crops does not necessarily mean limited production. Better yields could result, because of more intensive cultivation, more desirable crop rotations, more fertilizer, shifting of crops to land better adapted to them and the use of better seed. Increased use of improved varieties of such crops as soybeans and barley, and of corn hybrids could offset to a large degree the effects of smaller acreages. For hay the prospective production may exceed that of 1946.

	Average 1936–45	1946	Indicated 1947
	Thousands of acres		
Corn, all	92,914	90,027	87,599
All spring wheat	19,076	19,304	19,280
Durum	2,808	2,493	2,757
Other spring	16,269	16,811	16,523
Oats	41,669	47,048	46,620
Barley	14,763	11,594	11,714
Flaxseed	3,182	2,639	4,488
Rice	1,259	1,584	1,619
Sorghums for all purposes	16,797	14,753	13,109
Potatoes	2,945	2,625	2,310
Sweet potatoes	742	685	664
Tobacco*	1,592	1,938	1,908
Beans, dry edible	2,034	1,698	1,889
Peas, dry field	437	538	589
Soybeans†	10,391	11,494	12,213
Cowpeas†	2,925	1,216	1,116
Peanuts†	3,075	3,949	3,847
Hay*	72,373	74,352	74,337
Sugar beets	849	906	993

* Acreage harvested
† Grown alone for all purposes. Partly duplicated in hay acreage.

Superphosphate Output for 1946 Breaks Records

The figures compiled by the U. S. Bureau of Census show a record production of superphosphate during 1946, with a total output of 8,701,338 tons on the basis of 18 per cent A. P. A. This included 7,847,591 tons of normal superphosphate, 322,219 tons of 45 per cent concentrated, and 47,949 tons of 18 per cent base goods.

Production in all lines remained comparatively steady throughout the year. As the demand for phosphates was strong at all times, superphosphate producers were limited in their output only by the avilable supplies of rock and acid and the physical condition of their plants. The shortage of box cars and acid tank cars was a continual problem and the industry made a remarkable showing, in view of the handicaps under which they worked

SUPERPHOSPHATE PRODUCTION

1946	Normal 18% A.P.A. Tons	Concentrated 45% A.P.A. Tons	Base Goods 18% A.P.A. Tons
January	657,355	25,419	4,086
February	643,893	25,694	3,997
March	668,134	25,636	5,133
April	720,054	24,798	6,440
May	632,903	26,423	5,231
June	583,952	22,910	1,758
July	618,995	23,026	3,217
August	625,845	28,730	3,852
September	642,002	30,844	2,363
October	677,027	29,072	4,508
November	668,309	31,633	3,548
December	709,122	28,134	3,818
Total	7,847,591	322,319	47,949

New York Potato Fertilizer Study

Fertilizer Studies with the Potato is the title of an article in the American Potato Journal based on the research of Dr. Ora Smith of Cornell University. The object of the experiment was to study effects of several rates of application of 5-10-10 fertilizers, several methods of placement of fertilizer, several combinations of sources of nitrogen, and several combinations of sources of potash.

In summarizing the results Dr. Smith says, "Yields of U. S. No. 1 size potatoes resulting from applications of 2,400 pounds of 5-10-10 fertilizer to the acre averaged 52 bushels per acre more than with 1,200-pound applications. Other factors such as source of potash and method of fertilizer placement greatly influenced the yields obtained from any one rate of application.

"Yields of potatoes were greatly influenced by method of placement of the fertilizer. Of the three methods employed, that of one-half broadcast and plowed under with the balance in equal depth bands at planting time resulted in highest yields. The increases in yields for this method of application above that for all in bands at planting time ranged from 25 to 66 bushels to the acre, depending upon rate of fertilizer application and sources of nitrogen and potash.

"Of the three sources of potash used in these experiments, that of one-half muriate and one-half sulphate of potash magnesia consistently yielded higher than the other two sources, namely, muriate and sulphate of potash."

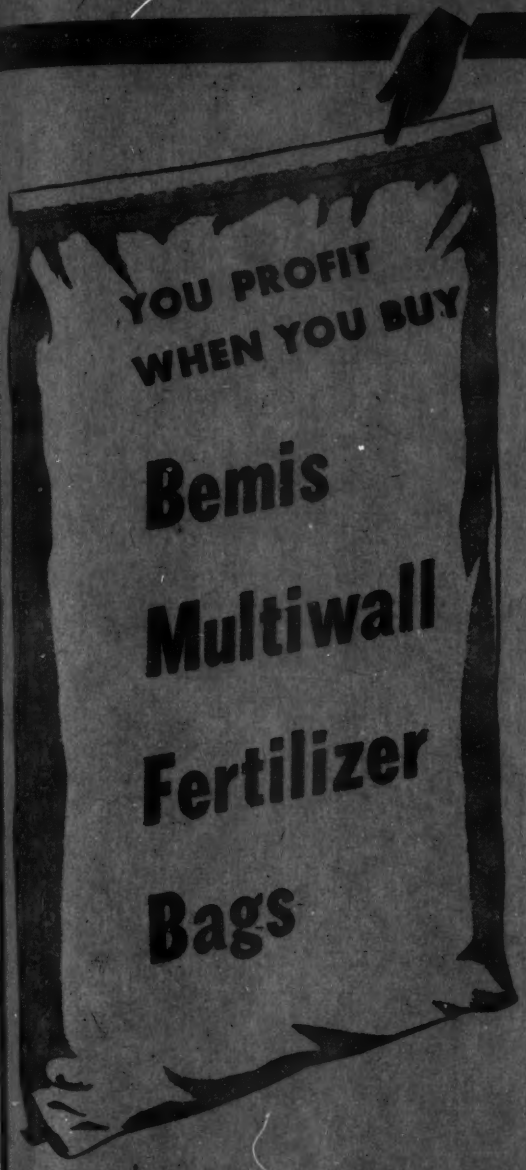
Bemis Elects Clarke Vice-President

At a recent meeting of the Board of Directors of Bemis Bro. Bag Company, A. H. Clarke was elected a Vice-President. He will be in charge of a newly formed general production department.

A graduate of Amherst College and Massachusetts Institute of Technology, Mr. Clarke joined the Bemis organization at Boston in 1915, and has served the company in many responsible positions since that time. Transferring to the company's Omaha factory in 1921 as Superintendent, he advanced rapidly to Sales Manager, and became Manager of that plant in 1932. In 1941 he was made a Director of the company, and the following year assumed the managership of the Bemis Cotton Mill and Bleachery at Indianapolis, remaining there until his recent promotion.

Mr. Clarke will direct production activities from the company's St. Louis General Offices.

4 Good Reasons Why...



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Nitrogen Pays on Even Low-Priced Cotton

Even on good land and with low cotton prices, it pays to apply nitrogen to cotton. Seventeen continuous years of tests have proved it so.

With seed cotton valued at three cents per pound, each ton of ammonium sulphate returned an average money value of $200.67 during the 17 years, according to C. B. Haddon, superintendent, Northeast Louisiana Experiment Station, St. Joseph, La., as reported in the March issue of *Nitrogen News and Views*, issued by the Coke Oven Ammonia Research Bureau.

During these test years, the average yield of check plot was 1,431 pounds seed cotton per acre. The average yield of the fertilized plot, which received a yearly application of 30 pounds of nitrogen per acre two weeks before cotton was planted, was 1,920.47 pounds per acre.

"It is interesting to note," Haddon points out, "that this work has been carried out on land sufficiently fertile to produce a bale of cotton per acre without the use of any fertilizer, legume, rotation, etc. The same plots have been used during the 17 years and the land planted to cotton each year."

The average increase of the fertilized plot over the check plot was 489.47 pounds, which gave an average increase of 16.3 pounds of seed cotton per pound of nitrogen used. This would be an increase of 6,689 pounds of cotton for each ton of ammonium sulphate applied.

Haddon states that in order to answer such a question as "Can the farmer afford to use fertilizer if the price of cotton should go down?" he based his cash return figure of $200.67 from each ton of sulphate of ammonia applied on seed cotton at three cents per pound.

Seed cotton at three cents per pound would be equal to lint cotton at approximately eight cents per pound. The lowest price farmers received for lint cotton during 1946, according to the United States Department of Agriculture, was 22.36 cents per pound. At this price, sulphate of ammonia was returning $560.88 per ton applied. The lowest price farmers have received for lint cotton since 1914 is 5.7, according to U. S. D. A. figures. Even at this low price, Haddon's average yield of cotton for the 17 years would have returned $114.38 per ton of sulphate of ammonia applied.

January Superphosphate Production

Production of superphosphate in all forms during January amounted to 829,752 tons (figured on the basis of 18 per cent A. P. A.). This was an increase of 6 per cent over the previous month's output of 782,275 tons, and 14 per cent above the January, 1946, figure of 724,989 tons. Production during January increased in the normal and base-goods types, while concentrated declined about 10 per cent from the previous month.

	Normal 18% A.P.A. Tons	Concentrated 45% A.P.A. Tons	Base Goods 18% A.P.A. Tons
Production			
Jan., 1947...	762,551	25,228	4,131
Dec., 1946...	709,122	28,134	3,818
Jan., 1946....	657,355	25,419	4,086
Sales and Used in Producing Plants			
Jan., 1947....	752,657	29,012	8,236
Dec., 1946...	664,252	29,588	2,047
Jan., 1946....	676,492	22,374	3,040
Stocks on Hand			
Jan. 31, 1947.	669,899	50,929	9,511
Dec. 31, 1946	646,278	54,713	13,616
Jan. 31, 1946.	831,603	35,663	16,623

Fertilizing Farm Fish Ponds

Home-grown fish are now a reality on hundreds of Arkansas farms. Farm ponds constructed as a part of a broad soil and water conservation program are being stocked with game fish which provide sport and valuable food with a minimum amount of attention.

A plentiful supply of fish can be produced from ponds which cover more than one-fourth of an acre, Extension Soil Specialist J. O. Dockins declared, if two basic rules are observed. The first is that the pond must be stocked with the proper number of the proper species of fish. The second rule is that ponds smaller than four or five acres must be fertilized.

Pond owners have found that the most common mistake in pond management is overstocking. There is a limit to the number of pounds of fish which can be produced in a pond of a given size, just as there is a limit to the number of pounds of beef which can be produced on a pasture of certain size. Overstocking, the University of Arkansas College of Agriculture specialist warns, will prevent any of the fish from attaining table size.

Fertilization is necessary to supply nourishment for the microscopic plant life which supports the fish. These tiny plants furnish food for insects and small water animals which are eaten by the bream, and which, in turn, feed the bass.

A complete commercial fertilizer should be distributed over the pond each once month from spring until fall at the rate of 100 to 125 pounds per acre of surface. When the pond is properly fertilized, the tiny plant life in the water will give it a greenish or brownish tinge and it will be impossible to see the bottom at a depth of more than 10 to 12 inches. Ponds larger than four or five acres in size are not usually fertilized because of the large amount of fertilizer they would require. Ponds this large will usually provide sufficient plant food to sustain the fish without fertilization, Mr. Dockins said.

Ponds which become muddy after rains should not be fertilized until spring floods end. When the silt settles to the bottom of the pond it takes out the plant life, causing the advantage of fertilization to be lost. Fertilizer should not be applied near the shoreline as this causes growth of undesirable weeds.

Fertilizers for Texas Cotton

The use of commercial fertilizers, where adapted, can play a big part in profitable cotton production, says E. A. Miller, extension agronomist of Texas A. and M. College.

Fertilization has a definite place in the Seven Step Cotton Program being carried to Texas farmers by the Extension Service, says the agronomist, and is one of the most dependable methods of increasing per-acre cotton yields. It pays good dividends on the sandy and sandy loam soils of the eastern half of Texas; on the Wilson and Crockett soils of Central and North Texas; and on the heavy black soils of the Gulf Coast Prairie.

At present prices of farm products, including cotton, fertilizers will really pay off, says Miller, as it takes only a small increase in yield to pay for the fertilizer.

Describing cotton work done by the Texas A. and M. College Agricultural Experiment Station, Miller states that increased yields on cotton ranging from 60 to over 100 pounds of lint an acre were obtained by the use of 400 pounds of fertilizer per acre at Experiment Substations at Tyler, Nacogdoches, Angleton and College Station.

Recommendations for fertilizing cotton on the sandy soils of East Texas are 300 to 400 pounds per acre of 5–10–5, 8–8–8, or 4–8–8 fertilizers. The latter two are especially good on land where cotton is affected by rust and fusarium wilt, says Miller. Potash in the fertilizers usually controls rust and makes cotton more resistant to wilt.

In the Gulf Coastal Prairie, 300 to 400 pounds of 6–12–0 are recommended on heavy black soils, and 5–10–5 appears best for sandy soils, says the agronomist.

On sandy soils in the drier sections of Texas, including the West Cross Timbers area and the Rio Grande Plain, only about half as much fertilizer per acre is recommended as in the more humid sections.

Aside from cotton, corn and grain sorghum yields can also be stepped up considerably in East Texas with fertilizer—300 to 400 pounds of 5–10–5 per acre before or at planting time, followed by a side-dressing of 100 pounds of ammonium nitrate or 200 pounds of nitrate of soda or sulphate of ammonia. And sweet potato yields have been boosted higher in that section of the state by using 600 pounds and in some cases up to 900 pounds per acre of 4–8–8 fertilizer.

Tennessee Farmer Gets Extra Corn at Little Cost

Three plots of corn last year demonstrated to Grady Carpenter, Fayette County (Tennessee) farmer, that correct use of fertilizer is one way of "buying" corn at a low rate. This is shown, says Bruce W. Hatcher, assistant U-T Extension agronomist, by figures on two fertilized plots, and one unfertilized plot.

The unfertilized field produced 60 bushels of corn per acre. One plot was given $11.36 worth of fertilizer, and it produced 100 bushels per acre. The third, was given $20.93 worth of fertilizer, and returned 108.8 bushels of corn.

On the field that produced 108.8 bushels per acre, 800 pounds of 10-6-4 fertilizer was broadcast and plowed down. Two hundred fifty pounds of 4-8-8 was drilled into the row at planting time. Total fertilizer cost was $20.93, thus the increased yield of 48 bushels per acre figures about 43 cents per bushel.

The field that produced 100 bushels per acre was treated with 400 pounds of 4-8-8 fertilizer in the row at planting time, and 200 pounds of nitrate of soda side-dressing when the corn was knee high. Fertilizer on this plot cost $11.36 giving an increase of 40 bushels per acre at a cost of 28 cents per bushel. Tennessee hybrid No. 10 seed corn was used throughout the test.

Carpenter's demonstration was one of 160 similar tests conducted last year by the Extension Service with the cooperation of the Tennessee Crop Improvement Association, and the Tennessee Fertilizer Council. Approximately 400 of the demonstrations will be held in Tennessee this year.

Fertilizer for Oats and Barley in Michigan

L. S. Robertson, specialist in soils at Michigan State College, urges farmers to review the general recommendations for fertilizers for oats and barley and to try to secure fertilizers these grains need.

On the lighter textured soils of the state—soils classed as light loams, sandy loams, and sands—it is recommended that a 3–12–12 analysis be used for oats. A 2–12–6 fertilizer may be substituted for a 3–12–12 where no legume is to be seeded with the oats. If a legume seeding is made, a top-dressing should be applied in a year. An 0–12–12 is recommended for the top-dressing.

On soils classed as loams or on sandy loams that have fairly heavy subsoils, it is recommended that either 3–12–12 or 2–16–8 be used. In case neither of these fertilizers is available, a 2–12–6 analysis fertilizer would prove to be the best substitute.

On heavy loams, silt loams, and clay loams, where manure has been applied to the field within two years—superphosphate 0–14–7, or 2–16–8 analysis fertilizer can be used. On soils that are known to be high in native available potash, superphosphate alone is recommended.

If the field has *not* been manured recently, a complete fertilizer such as 2–12–6 or 2–16–8 is recommended.

Indiana Recommendations for Available Fertilizer Grades

Heavy demand for fertilizer for pastures, corn, oats, and other spring planted crops make the available supply insufficient to meet either the demand or all needs. To get the maximum returns from fertilizers that are on hand, G. P. Walker, Purdue University extension agronomist, makes the following suggestions to Indiana farmers:

Drill from 200 to 300 pounds of such fertilizers as 2–12–6 or 3–12–12 with oats. The

newer varieties of oats are giving a fine response to fertilizers containing nitrogen and these applications are doubly important where clover or mixed seedings are made.

Apply available fertilizer at 100 to 200 pounds per acre in the row or hill for corn with or without plow-under fertilizer. On soils testing medium to high in phosphate and potash, plow under 200 to 300 pounds of straight nitrogen fertilizer with corn stalks or combined soybean and small grain straw on less fertile soils. Where high nitrogen mixtures like 8–8–8 are available, plow under at 500 to 800 pounds per acre for corn, preferably on hard run land or following corn, soybeans or small grain rather than legume sods or one year growth of sweet clover. Plow under no low nitrogen mixtures like 2–12–6 or 3–12–12 or straight phosphate-potash mixtures. Where phosphate-potash mixtures both with and without nitrogen are available, use the straight phosphate-potash goods in the corn row and the nitrogen mixture with oats.

For top-dressing or renovating permanent pasture, use available phosphate or phosphate-potash mixtures at 300 to 500 pounds per acre.

Phosphate Variable in Fertilizer Value

Farmers buying phosphate fertilizers need to be careful in getting the right kind, to avoid putting out too much money for the fertilizing values obtained.

"This year, due to the shortage of fertilizer, especially superphosphate and treble superphosphate, considerable quantities of raw rock phosphate, colloidal phosphate and marine phosphates are being offered for sale," says Dr. C. C. Volkerding, associate soil scientist of the North Dakota Agricultural Experiment Station.

His advice to the farmer buying phosphate fertilizer is "pay particular attention to the 'availability' of the phosphate because only the 'available' form can be most readily used by plants.

"Raw rock phosphate, colloidal phosphate and marine phosphate are largely 'unavailable,' or very slowly available, and the phosphate content of these materials is usually expressed as total phosphate or phosphoric acid content, rather than *available* phosphate."

Analysis of colloidal phosphate by the U. S. Department of Agriculture indicates less than one-third of the colloidal phosphate is available by the citric acid test. About seven times as much colloidal phosphate must be applied per acre to provide an amount of available phosphate equal to treble superphosphate.

"Even with these high rates of application of colloidal phosphate, results will usually be poorer than with the superphosphate because much of the phosphate in superphosphate is soluble in water, while little or none of the rock or colloidal phosphate is water soluble."

Further, it is pointed out that freight charges per ton on colloidal phosphate shipped from Florida to North Dakota "is about equal to the cost of the fertilizer at the plants in Florida."

THE PHOSPHATE INDUSTRY

(Continued from page 10)

close to the country's consuming areas. One reason for this is that fertilizer is a heavy material of relatively low cost. In locating a plant, freight costs of raw materials and finished products play a big part in the decision. The largest number of acidulating plants accordingly is found in the southeastern section of the country. Table IV gives a quick review of the country's capacity and production. It was prepared by Dr. Firman E. Bear based on NFA data.

TABLE IV
U. S. CAPACITY AND PRODUCTION
TONS P_2O_5

Year	Capacity			Total Production
	Normal Superphosphate	Concentrated Superphosphate	Total Capacity	
1920	1,500,000	10,000	1,510,000	895,000
1930	1,745,000	45,000	1,790,000	795,000
1940	1,520,000	130,000	1,650,000	875,000
1944	1,575,000	215,000	1,790,000	1,380,000
1945–1946*	2,067,500	360,000	2,427,500	1,525,000

* From Production and Marketing Administration, U. S. D. A. This did not appear in original table.

As the world becomes more and more aware of the part which fertilizers can play in producing more food with less labor, each country is going to try to educate its farmers to a more intensive use of commercial fertilizers. It is recognized that lime and fertilizers were greatly responsible for this country's remarkable production of foodstuffs during the years of the recent war. Lime and phosphate are essential to an abundant production of legumes and grasses which form the basis of good crop rotation practices.

The world shortage of plant foods at present is enormous. Our domestic production of phosphates and other fertilizer materials should be maintained at peak levels for several years in view of the present world situation.

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